The Mechanic.

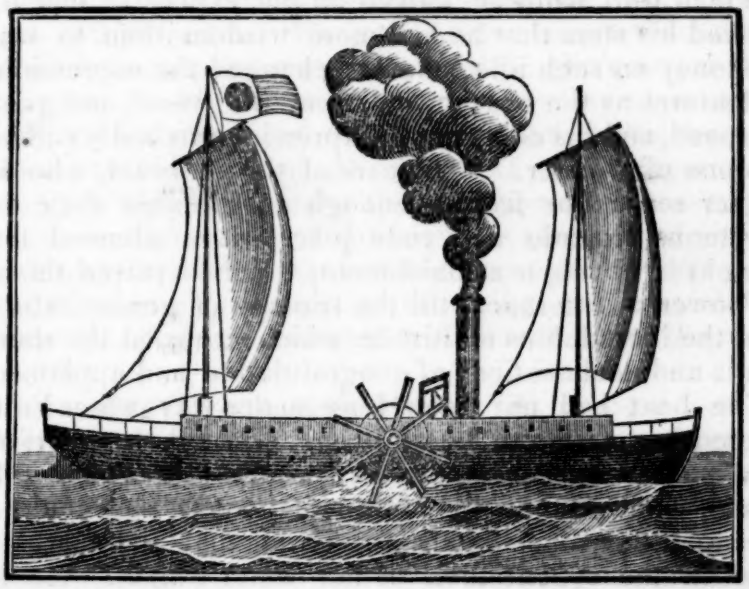
JUNE, 1834.

[Compiled for the Mechanic.]

ROBERT FULTON.

[Concluded.]

THE NORTH RIVER, OR CLERMONT.



[THE above engraving represents the first Fulton Boat built in America, for the design of which we are indebted to the New York Mechanics' Magazine.]

VERY soon after Mr. Fulton's arrival in New York, he commenced building his first American boat. While she was constructing, he found that her expenses would greatly exceed his calculations. He endeavored to lessen the pressure on his own finances, by offering one-third of the right, for a proportionate contribution to the expense. It

was generally known that he made this offer, but no one was then willing to afford this aid to his enterprise, although so many, since its success, have been eagerly grasping at its profits.

In the spring of 1807, the first Fulton boat built in this country was launched from the ship-yard of Charles Brown, on the East-River. The engine from England was put on board of her, and in August, she was completed, and was moved by her machinery from her birth-place to the Jersey shore. Mr. Livingston and Mr. Fulton had invited many of their friends to witness the first trial, among whom were those learned men, Dr. Mitchill and Dr. M'Neven, to whom we are indebted for some account of what passed on this occasion. Nothing could exceed the surprise and admiration of all who witnessed the experiment. The minds of the most incredulous were changed in a few minutes. Before the boat had made the progress of a quarter of a mile, the greatest unbeliever must have been converted. The man who, while he looked on the expensive machine, thanked his stars that he had more wisdom than to waste his money on such idle schemes. changed the expression of his features as the boat moved from the wharf and gained her speed, and his complacent expression gradually stiffened into one of wonder. The jeers of the ignorant, who had neither sense nor feeling enough to suppress their contemptuous ridicule and rude jokes, were silenced for a moment by a vulgar astonishment, which deprived them of the power of utterance, till the triumph of genius extorted from the incredulous multitude which crowded the shores, shouts and acclamations of congratulation and applause.

The boat had not been long under way, when Fulton ordered her engine to be stopped. Though her performance so far exceeded the expectations of every other person, and no one but himself thought she could be improved, he immediately perceived that there was an error in the construction of her water-wheels. He had their diameters lessened, so that the buckets took less hold of the water, and when they were again put in motion, it was manifest that the alteration had increased the speed of the boat. It may well be said, that the man of genius and knowledge has a sense beyond those which are common to others, or that he sees with different eyes. How many would have gazed on these ill-proportioned wheels, without perceiving that they were imperfect.

This boat, which was called the Clermont, soon after made a trip to Albany. Mr. Fulton gives the following account of this voyage in a letter to his friend, Mr Barlow. 'My steam-boat voyage to Albany and back, has turned out rather more favorable than I had calculated. The distance from New York to Albany is one hundred and fifty miles: I ran it up in thirty-two hours, and down in thirty. I had a light breeze against me the whole way, both going and coming, and the voyage has been performed wholly by the power of the steam-engine. I overtook many sloops and schooners beating to windward, and parted with them as if they had been at anchor. The power of propelling boats by steam is now fully proved. The morning I left New York, there were not perhaps thirty persons in the city, who believed that the boat would ever move one mile an hour, or be of the least utility; and while we were putting off from the wharf, which was crowded with spectators, I heard a number of sarcastic remarks. This is the way in which ignorant men compliment what they call philosophers and projectors. Having employed much time, money, and zeal, in accomplishing this work, it gives me, as it will you, great pleasure to see it fully answer my expectations. It will give a cheap and quick conveyance to the merchandize on the Mississippi, Missouri, and other great rivers, which are now laying open their treasures to the enterprize of our countrymen; and although the prospect of personal emolument has been some inducement to me, yet I feel infinitely more pleasure in reflecting on the immense advantage that my country will derive from the invention,' &c.

Soon after this successful voyage, the Hudson boat was advertised and established as a regular passage-boat between New York and Albany. She, however, in the course of the season, met with several accidents, from the hostility of those engaged in the ordinary navigation of the river, and from defects in her machinery; the greatest of which was, having her water-wheel shafts of cast iron, which was insufficient to sustain the great power applied to them. The wheels also were hung without any support for the outward end of the shaft, which is now supplied by what are called the wheel-guards.

At the session of 1808, a law was passed to prolong the time of the exclusive right to thirty years; it also declared combinations to destroy the boat, or wilful attempts to

injure her, public offences, punishable by fine and imprisonment.

Notwithstanding her misfortunes, the boat continued to run as a packet, always loaded with passengers, for the remainder of the summer. In the course of the ensuing winter she was enlarged, and in the spring of 1808, she again commenced running as a packet-boat, and continued it through the season. Several other boats were soon built for the Hudson river, and also for steam-boat companies formed in different parts of the United States.

On the 11th of February, 1809, Mr. Fulton took out a patent for his inventions in navigation by steam, and on the 9th of February, 1811, he obtained a second patent for some improvements in his boats and machinery.

It having been found that the laws, granting to Livingston and Fulton exclusive privileges, were insufficient to secure their enjoyment, the legislature of New York, in 1811, passed a supplementary act, giving certain summary remedies against those who should contravene the protecting laws. The act, however, excepts two boats which were then navigating the Hudson, and one which ran on Lake Champlain in opposition to Livingston and Fulton: without these exceptions, the law, as to these boats, would have been *ex post facto*. In respect to these, therefore, the parties were left to the same remedies as before passing the last act. The opposition boats on the Hudson, were at first to have been prepelled by a pendulum, which some thought would give a greater power than steam; but on launching their vessel they found the machinery was not so easily moved, as when she was on the stocks. Having found by experiment that a pendulum would not supply the place of steam, and knowing no other way of applying steam than that they saw practised in the Fulton boats, they adopted all their machinery with some small alterations, with no other view than to give a pretence for claiming to be the inventors of improvements on steam-boats.

Messrs. Livingston and Fulton attempted to vindicate their rights, and to stop these boats, by an application to the Circuit Court of the United States for an injunction; but the judge decided that he had not jurisdiction of the case. They then made application to the Court of Chancery of the state, but the Chancellor, after hearing an argument for several days, refused to grant an injunction. An appeal to the Court of Errors, composed of the Senate

of the state, and the five judges of the Supreme Court, unanimously reversed the decision of the Chancellor, and ordered a perpetual injunction; so that the boats could no more be moved with steam, than they could by a pendulum. The merits of the members of this Pendulum Company were contrasted with those of Fulton, by Mr. Emmet, the counsel for the appellants. He described them 'as men who never wasted health and life in midnight vigils, and painful study, who never dreamt of science in the broken slumbers of an exhausted mind, and who bestowed on the construction of a steam-boat just as much mathematical calculation, and philosophical research, as in the purchase of a sack of wheat, or a barrel of ashes.'

About the year 1812, two steam ferry-boats were built under the directions of Mr. Fulton for crossing the Hudson river, and one of the same description for the East River. These boats were what are called twin-boats; each of them being two complete hulls united by a deck or bridge. They were sharp at both ends, and moved equally well with either end foremost; so that they crossed and re-crossed without losing any time by turning about. He contrived, with great ingenuity, floating docks for the reception of these boats, and a means by which they are brought to them without a shock.

From the time the first boat was put in motion till the death of Mr. Fulton, the art of navigating by steam was fast advancing to that perfection of which he believed it capable: for some time the boat performed each successive trip with increased speed, and every year improvements were made. The last boat built by him has invariably been the best, the most convenient and the swiftest.

The last passage-boat which was constructed under Mr. Fulton's directions, and entirely according to drawings and plans furnished by him, was for navigating the Sound from New York to New Haven. She was nearly 400 tons burden, built with uncommon strength, and fitted up with great convenience and elegance. She was the first steam-boat that had a round bottom like a ship. This form was adopted, because, for a great part of her route, she would be as much exposed as she could be on the ocean. It was therefore necessary to make her a perfect sea-boat. She passed daily, and at all times of the tide, the dangerous strait of Hell-Gate, where for the distance of nearly a mile, she often encountered a current running at the rate of at least six miles an hour. For

some distance, she had within a few yards of her on each side, rocks and whirlpools which rival Scylla and Charybdis, even as they are poetically described. This passage, previously to its being navigated by this vessel, was always supposed to be impassable, except at certain stages of the tide; and many a shipwreck has been occasioned by a small mistake in the time. The boat passing through these whirlpools with rapidity, while the angry waters are foaming against her bows, and appearing to raise themselves in obstinate resistance to her passage, is a proud triumph of human ingenuity. The owners, as the highest tribute they had in their power to offer to his genius, and as an evidence of the gratitude they owed him, called her The Fulton.

The following anecdote shows the quickness of apprehension, as well as the practical knowledge of Mr. Fulton. It will be remembered by some of our readers, how long, and how successfully, Redheffer had deluded the Pennsylvanians by his perpetual motion. One of these machines was put into operation in New York in 1813. Mr. Fulton was a perfect unbeliever in Redheffer's discovery, and although hundreds were daily paying their dollar to see the wonder, he could not be prevailed upon to follow the crowd. After a few days, however, he was induced by some of his friends to visit the machine. It was in an isolated house in the suburbs of the city. In a very short time after Mr. Fulton had entered the room in which it was exhibited, he exclaimed, 'why, this is a crank motion.' His ear enabled him to distinguish that the machine was moved by a crank, which always gives an unequal power, and therefore an unequal velocity in the course of each revolution; and a nice and practical ear may perceive that the sound is not uniform. If the machine had been kept in motion by what was its ostensible moving power, it must have had an equable rotary motion, and the sound would have been always the same.

After some little conversation with the show-man, Mr. Fulton did not hesitate to declare that the machine was an imposition, and to tell the gentleman that he was an impostor. Notwithstanding the anger and bluster which these charges excited, he assured the company that the thing was a cheat, and that if they would support him in the attempt, he would detect it at the risk of paying any penalty if he failed. Having obtained the assent of all who were present, he began by knocking away some very

thin pieces of lath, which appeared to be no part of the machinery, but to go from the frame of the machine to the wall of the room, merely to keep the corner posts of the machine steady. It was found that a catgut string was led through one of these laths and the frame of the machine, to the head of the upright shaft of a principal wheel; that the catgut was conducted through the wall, and along the floors of the second story to a back cock-loft, at a distance of a number of yards from the room which contained the machine, and there was found the moving power. This was a poor old wretch with an immense beard, and all the appearance of having suffered a long imprisonment; who, when they broke in upon him, was unconscious of what had happened below, and who, while he was seated on a stool, gnawing a crust, was with one hand turning a crank. The proprietor of the perpetual motion soon disappeared. The mob demolished his machine, the destruction of which immediately put a stop to that which had been, for so long a time, and to so much profit, exhibited in Philadelphia. The merits of this exposure will appear more striking, when we consider that many men of ingenuity, learning and science, had seen the machine: some had written on the subject; not a few of these were his zealous advocates, and others, though they were afraid to admit that he had made a discovery which violated what were believed to be the established laws of nature, appeared also afraid to deny what the incessant motion of his wheels and weights seemed to prove.

Mr. Fulton had enlarged views of the advantages of internal improvements, both as regards commerce, and the stability of the union, by a free intercourse between the states. As early as 1807, he pointed out the practicability of opening a communication between the great lakes and the Hudson, and in 1811, he was appointed a commissioner to explore the route of an inland navigation, from Hudson River to Lake Erie. His calculations of the advantages of the project are very interesting, and may be found appended to Colden's life of Fulton.

At the commencement of the year 1814, a number of the citizens of New York, alarmed at the exposed situation of their harbor, had assembled with a view to consider whether some measures might not be taken to aid the government in its protection. This assembly had, in fact, been invited by some knowledge of Mr. Fulton's plans for sub-marine

attack, and of his contemplating other means of defence. They deputed a number of gentlemen to act for them, and these were called the coast and harbor committee. Mr. Fulton exhibited to this committee the model and plans for a vessel of war, to be propelled by steam, capable of carrying a strong battery, with furnaces for red-hot shot, and which, he represented, would move at the rate of four miles an hour. The confidence of the committee in this design was confirmed by the opinions of many of our most distinguished naval commanders, which he had obtained in writing, and exhibited to the committee. They pointed out many advantages which a steam-vessel of war would possess over those with sails only.

The national legislature passed a law in March, 1814, authorizing the President of the United States to cause to be built, equipped, and employed, one or more floating batteries for the defence of the waters of the United States. A sub-committee of five gentlemen was appointed to superintend the building of the proposed vessel, and Mr. Fulton, whose soul indeed animated the whole enterprise, was appointed the engineer. In June, 1814, the keel of this novel and mighty engine was laid, and in October, she was launched from the yard of Adam and Noah Brown, her able and active architects. The scene exhibited on this occasion was magnificent. It happened on one of our bright autumnal days. Multitudes of spectators crowded the surrounding shores, and were seen upon the hills which limited the beautiful prospect. The river and bay were filled with vessels of war, dressed in all their variety of colors, in compliment to the occasion. By May, 1815, her engine was put on board, and she was so far completed as to afford an opportunity of trying her machinery. But, unhappily, before this period, the mind that had conceived and combined it was gone. On the fourth of July, in the same year, the steam-frigate made a passage to the ocean and back, a distance of 53 miles, in 8 hours and 20 minutes, by the mere force of steam. In September, she made another passage to the sea, and having at this time the weight of her whole armament on board, she went at the rate of five and a half miles an hour, upon an average, with and against the tide. The superintending committee gave, in their report, a full description of the Fulton the First, the honored name this vessel bore.

We now come to mention the last work in which the active and ingenious mind of Mr. Fulton was engaged. This was a project for the modification of his sub-marine boat. He presented a model of this vessel to the government, by which it was approved; and under the authority of the executive, he commenced building one; but before the hull was entirely finished, his country had to lament his death, and the mechanics he had employed were incapable of proceeding without him.

During the whole time that Mr. Fulton had thus been devoting his talents to the service of his country, he had been harassed by lawsuits and controversies with those who were violating his patent rights, or intruding upon his exclusive grants. The state of New Jersey had passed a law which operated against Mr. Fulton, without being of much advantage to those interested in its passage; inasmuch as the laws of New York prevented any but Fulton's boats to approach the city of New York. Its only operation was to stop a boat owned in New York, which had been several years running to New Brunswick, under a license from Messrs. Livingston and Fulton. A bold attempt was therefore made to induce the legislature of the state of New York, to repeal the laws which they had passed for the protection of their exclusive grant to Livingston and Fulton. The committee reported a law which they said might be passed consistently with good faith, honor, and justice! This report being made to the house, it was prevailed upon to be less precipitate than the committee had been. It gave time, which the committee would not do, for Mr. Fulton to be sent for from New York. The senate and assembly in joint session examined witnesses. and heard him and the petitioner, by council. The result was, that the legislature refused to repeal the prior law, or to pass any act on the subject. The legislature of the state of New Jersey, also, repealed their law, which left Mr. Fulton in the full enjoyment of his rights. But alas! this enjoyment was of very short duration; for on returning from Trenton, after this last trial, he was exposed on the Hudson, which was very full of ice, for several hours. He had not a constitution to encounter such exposure, and upon his return, found himself much indisposed from the effects of it. He had at that time great anxiety about the steam-frigate, and, after confining himself for a few days, he went to give his superintendence

to the artificers employed about her. Forgetting his debilitated state of health in the interest he took in what was doing on the frigate, he remained too long exposed, in a bad day, to the weather on her decks. He soon felt the effects of this imprudence. His indisposition returned upon him with such violence as to confine him to his bed. His disorder increased, and on the 24th day of February, 1815, terminated his valuable life.

It was not known that Mr. Fulton's illness was dangerous, till a very short time before his death, which was unexpected by his friends, and still more so by the community. As soon as it was known, all means were taken to testify, publicly, the universal regret at his loss, and respect for his memory. The newspapers that announced the event, had those marks of mourning, which are usual in our country when they notice the death of public characters. The corporation of the city of New York, the different literary institutions and other societies, assembled and passed resolutions expressing their estimation of his worth, and regret at his loss. They also determined to attend his funeral, and that the members should wear badges of mourning for a certain time. As soon as the legislature, which was then in session at Albany, heard of the death of Mr. Fulton, they expressed their participation in the general sentiment, by resolving that the members of both houses should wear mourning for some weeks.

This is the only instance, we believe, of such public testimonials of regret, esteem, and respect being offered on the death of a private citizen, who never held any office, and was only distinguished by his virtues, his genius, and the employment of his talents.

In the year 1806, Mr. Fulton married Miss Harriet Livingston, a daughter of Walter Livingston, Esq., a relative of his enterprising associate, Chancellor Livingston. He left four charming children; one son, Robert Barlow Fulton, and three daughters.

In conclusion, it may be proper to make a few remarks in relation to the labors of Mr. Fulton. He was not the *original inventor* of steam-boats, because many had made them before him; neither was he the *perfector*, because the thing is not yet perfect. What was he, then? Why, he was the first to gain the prize; he it was who satisfied the law; and since his boat went from New York to Albany, there has always been a regular succession of steam-boats;

so that he was the first to bring them into public use, and by his genius and perseverance, he so improved them as to lay a solid foundation for those who came after him to build upon. Professor Renwick has given a concise history of the invention of the steam-boat, in his Treatise on Steam-engines; and has taken the right view of the subject, in our opinion, in relation to Mr. Fulton. Although there may be those in our own country, as well as in England and France, who are unwilling to give Mr. Fulton his full share of praise, on account of themselves or their relations having been interested in this invention, yet there are others in all these countries who are willing to do him justice. The following is an extract from a memoir published in Paris some years ago; it is from the pen of Mr. Frederic Royou. 'I willingly applaud the patriotic sentiment by which M. de Jouffroy desired that the honor of so great an invention should be attributed to a Frenchman. Unhappily, however, it is here a question, much less of an invention, than of the application of a power already known. Besides, Fulton has never claimed the merit of being the inventor in this sense. The application which he made, may be considered as ordinary and common in its nature, because it was pointed out by so many scientific men; but the means of application were necessary, and Fulton has procured them.' We extract the following from the English Penny Magazine, which, it is said, has a million of readers. 'Fulton, the inventor of the steam-boat in North America, which, in a few years, has produced such an astonishing change in that vast country, by connecting together its most distant states, sustained the mortification of not being comprehended by his countrymen. He was, therefore, treated as an idle projector, whose schemes would be useless to the world and ruinous to himself.' And again, we find in the same work the following, 'We cannot enter into a controversy whether Fulton, or Mr. William Lymington, was the *inventor* of the steam-boat. What has been said of Arkwright may apply to Fulton:—'The several inventions which his patent embraced, whether they were his or not, would, probably, but for him, have perished with their authors; none of whom, except himself, had the determination and courage to face the multiplied fatigues and dangers that lay in the way of achieving a *practical* exemplification of what they had conceived in their minds.'

Fulton may be compared with Watt. Both were persevering, and had great inventive powers; and both were fortunate alike in obtaining the confidence and support of patrons, who were generous, and who possessd ample fortunes. In this relation stood Mr. Bolton, and Chancellor Livingston.

[For the Mechanic.]

MEANS CONSIDERED OF PRESERVING BUILDINGS FROM FIRE.

Carelessness is one fruitful source of fires, and attention and care would secure us from many of the fires to which we are exposed. But as accidents will happen, especially in a country where for nine months of the year, fire is an article of absolute necessity, means of easily erecting safe fire-proof buildings will at all times commend themselves to the public. The framing of buildings with iron, which may ere long be introduced in architecture, at least in England, will be one grand approximation towards this desideratum. With wooden frames, however, I believe fire-proof buildings might be erected, of course, with brick walls, if the timber-work which supports the floors, be carefully enveloped with mortar on every side, where exposed to the atmosphere, and where it is jointed with, or approaches other wood-work. By this precaution, fire will be prevented from passing through floors, from story to story. Partitions should be made of brick, and the wood-work of one apartment should not be permitted to communicate, through doors and internal windows, with that of another apartment. To prevent this, the door and window frames must be of metal.

Metallic doors, might, I conceive, be made in the following manner, so as to combine with easiness of management and sufficient lightness, elegance appropriate to the richest parlors.

A light, and if required, hollow *frame* should be made of iron, with *pannels* of thin sheet brass, put together like any panneled door. The brass being polished, and the iron either bronzed or lackered, and painted with green, or some other rich color, this door will be as elegant as any wood-work door. For out-side doors, of course, the work should

be heavier and stouter. These doors will also be exempt from the disorders of swelling, shrinking and warping, to which wooden doors are subject, and this will give them an advantage, as they will always shut tight.

EUCLID MINOR.

SMOKY CHIMNEYS.

COUNT RUMFORD observes that the general fault of common chimneys, is the great size of the opening at the throat. The following are the rules given by him relative to the best mode of constructing chimneys.

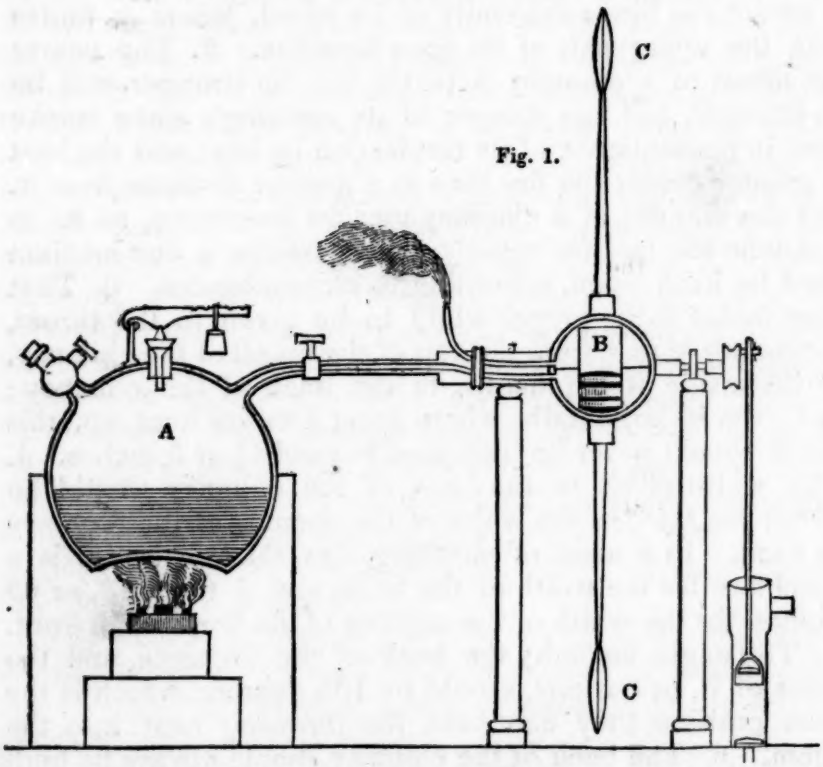
1. 'The *throat* of the chimney should be perpendicularly over the *fire*, as the smoke and hot vapor which rise from a fire naturally tend *upwards*. By the *throat* of a chimney is meant the lower extremity of its canal, where it unites with the upper part of its open fireplace. 2. The nearer the throat of a chimney is to the fire the stronger will be its *draught*, and less danger of its smoking; since smoke rises in consequence of its rarefaction by heat, and the heat is greater nearer the fire than at a greater distance from it. But the draught of a chimney may be too strong, so as to consume the fuel too rapidly, and therefore a due medium must be fixed upon, according to circumstances. 3. That *four inches* is the proper width to be given to the throat, reckoning across, from the top of the breast of the chimney, or the inside of the mantle, to the back of the chimney; and even in large halls, where great fires are kept up, this width should never be increased beyond 4½ or 5 inches. 4. The width given to the back of the chimney should be about *one third* of the width of the opening of the fireplace in front. In a room of middling size, *thirteen inches* is a good size for the width of the back, and 3 times 13, or 39 inches, for the width of the opening of the fireplace in front. 5. The angle made by the back of the fireplace, and the sides of it, or covings, should be 135 degrees, which is the best position they can have for throwing heat into the room. 6. The back of the chimney should always be built *perfectly upright*. 7. Where the throat of the chimney has an end, that is to say, where it enters into the lower part of the open canal of the chimney, *there* the three walls which form the two covings and the back of the fireplace should *all end abruptly*, without any slope, which will

render it more difficult for any wind from above to force its way through the narrow passage of the throat of the chimney. The back and covings should rise 5 or 6 inches higher than the breast of the chimney. 8. The current of air, which, passing under the mantle, gets into the chimney, should be made *gradually to bend its way upwards*, by which means it will unite quietly with the ascending current of smoke. This is effected with the greatest ease and certainty, merely by *rounding off* the breast of the chimney, or back part of the mantle, instead of leaving it flat or full of holes and corners.

[For the Mechanic.]

ROTARY STEAM-ENGINE.

Fig. 1.



Messrs. Editors:—About four years ago, I made a working model of a rotary engine, which performed pretty well, and thinking it might be interesting to some of your readers, I have sent a drawing and description of it, for insertion in the Mechanic.

A. fig. 1, represents a small steam boiler, heated by a spirit lamp; B, a cylinder, in the lower half of which a solid piston of lead is shown by the shaded part. The cylinder is surrounded by a globular case, divided into two hemispheres by a bridge, which connects the cylinder with the case. In the axis, towards the boiler, are two steam-passages, one leading from the boiler to the lower part of the case, the other leading from the upper half of the case to the open air. The ends of the cylinder are far enough from the case to allow the steam to pass under the piston, to push it up. The shape of the steam passages are shown near the centre of fig. 2. cc, in both figures, are two balance weights placed on the revolving arms, to give momentum to the machine.

Fig. 2.

When the steam is turned on, if the revolving arms are placed in a perpendicular direction, no motion will take place, but if the arms are turned a little to the right, or the left, motion will be produced in that direction to which the arms tend. It will be perceived that the piston or weight, which gives motion to the machine, is always on the descending side; for as soon as it reaches its lowest point, it is instantly thrown to the top by the force of steam; and the principal difficulty in the way of making a powerful engine upon this plan, is, that we have no substance sufficiently heavy from which to make the piston; but if we had a cheap metal as much heavier than platina as that metal is heavier than common air, then we might have a simple and powerful rotary steam-engine. PHILO.

[For the Mechanic.]

SPECULATING ON PATENTS.

MESSRS. EDITORS:—I was much pleased with an article in the March number of the Mechanic, respecting a National Academy on Patents; it is a subject, that I have often thought of, on looking around me, and seeing several of my neighbors reduced to poverty and distress, by purchasing rights of a travelling patentee, which instead of being

useful, have, from the loss resulting to the buyer, been worse than nothing. I am not acquainted with any particular plan of security, yet still I hope something will be done soon to put a stop to this crying evil.

In this quarter, the brick, thrashing, churning and other patent machines which have been peddled out, have been a sinking of time and property, frequently to a great extent. So many cases of this kind have come under my notice, that I have often thought the ends of justice would be answered, if any one peddling a patent were subjected to a fine and imprisonment.

In the present state of things, the following rule, which I believe to be almost infallible, may be beneficial. It is, if a man obtains a patent that is useful, he will devise some means to manufacture the machine or improvement, or whatever it may be; but if it is useless, he will be sure to visit towns, counties, and sometimes states, for the express purpose of speculating on his ability to represent a worthless article, as a cheap and useful improvement, lately discovered, and successfully put to the test. PRELUDE.

East Bridgewater, April 28th, 1834.

EDUCATION.

THE following spirited remarks are a part of an Address delivered by John Neal, Esq., before the Portland Mechanic Association. Mr. Neal is deserving of much more credit than he has ever received, for his interest in the improvement of the mass of the people.

BUT who are the privileged class in our country, where all men are equal,—where we have no kings, no princes, no nobility, no titles! Look about you, I say again—look about you, and judge, every man for himself. Are they not the ***better educated***, everywhere—and the children of the better educated—throughout the land? Go abroad among your neighbors, let all your acquaintances pass in review before you—and see if those who are better off in the world, more influential and happier than the rest, ***other circumstances being equal***, are not all—all without one exception, better educated than the rest? It is not the college education that I speak of here; it is not even a school education obtained before a man sets up for himself, but it is education at large, in the broadest and best sense of the term—

the education that any body may give himself, *any body at any age.* Again, therefore, I do appeal to yourselves to call to mind any of your acquaintance who has got ahead of his brethren—who is looked up to, not only by them but by others,—and my life on it that you find him a better educated man, self-educated, or otherwise, I care not, better informed about some things which *they* do not consider of importance. I go further—so perfectly satisfied am I of the truth of this doctrine—of the importance of things which the uneducated regard as trivial, that I would have this taught as a fundamental truth, namely, that if two persons were to begin the world to-morrow—both of the same capacity—both of the same age and same character—having the same friends, the same prospects, and the same health—he who was best acquainted with the multiplication table would beat the other in the long run. I would have it generally understood as another fundamental maxim in morals, if not in religion, that every sort of knowledge is of some value to every person, whatever may be his character, station or prospects. I do not say that it would be of *equal* value to every person, or that every sort of knowledge is alike *necessary.* I merely say, that we cannot acquire any *useless* knowledge.

But, say those who appear to have understanding and judgment in these matters, we have no time for study—we the mechanics ——. No time for study! What! have you no time, when a huge ponderous body is to be lifted—no time to fix the lever and the fulcrum; to prepare the inclined plane or hitch the tackle? Is it economy of time for you to do that with your hands, which might be done with the simplest piece of machinery? Would you set your apprentices to work, your journeymen and yourselves to lift and carry by main strength what a child might push forward on a roller, if you would but take time enough to fix the roller? What would you say of a man who instead of using the plough where others do, should persist in digging a large field with a fire-shovel, because he had never been brought up to the plough? What if a man who, instead of splitting his logs for fire-wood with a beetle and wedge, were to saw them in two lengthwise with a key-hole saw—declaring all the while, that as for him, he did not pretend to know much about mechanics—that a key-hole saw was good enough for him,—and as for the beetle-and-wedge, and other out-of-the-way contrivances, for his part he had no belief in them?

Would you not laugh at him as a poor economist of *time*, and a very poor reasoner? and would he not be likely to continue a very poor man? Yet he would say no more than you say—every man of you—when you declare that you have no time for reading—no time for study—no time to improve yourselves, each in his own particular trade, by stepping out of the circle he was brought up in. How do you know but there is some shorter and easier way of doing *all that you do* in your workshops and factories? Be assured that there is a shorter and easier way for all of us—that there is no one thing we do, in which improvements may not be made. Have you not the proof continually before your eyes? Are not the *master workmen*, the *owners* and the *employers* of other men—are they not those who have made the best use, not of their *fingers*, but of their *thinkers*?

MISCELLANY.

MAELZEL'S RIVAL.—A French watchmaker has invented a piece of mechanism, for which he justly deserves to rank with Maelzel, as a skilful and ingenious artificer. It is thus described in the Paris Journal des Debats:

'On an ornamental vase, a juggler about 6 inches in height, and dressed in the Turkish costume, is represented seated beneath a canopy with a little table before him; at his right hand is a stand, on which are placed three goblets and a drum. In the first place, you hear a delightful overture, executed by some internal mechanism. When this is finished, the little juggler, as a juggler should, rises and bows three times to the company. He then takes two of the goblets, and three silver balls, which he causes to pass successively from beneath one of the inverted goblets to the other, so rapidly as to deceive the eye, until they are all found at last under one. He then replaces the goblets, and strikes three times upon the drum, which opens, and displays a little dancer, who flourishes upon the table with infinite grace, accompanied by music produced by mechanism; while the juggler beats time, and expresses his approbation by significant gestures. The dancer then retires within the drum, and the juggler lifts the third goblet, beneath which is perceived a silver egg, from which issues a beautiful and

richly colored little bird. This bird takes its station on the egg, claps its wings, and sings an air. When this is over, the juggler replaces the goblet, bows, and resumes his seat; and another air closes the exhibition. The artist was employed for the space of five years in completing this piece of mechanism, and sold it for 500,000 francs.'

Perpetual Motion, &c. discovered.—A correspondent in North Berwick writes us as follows:—'Mr. William Buckle, a respectable tradesman of this place, has, after years of close study and observation of the celestial bodies, discovered the perpetual movement. He has not only discovered wherein longitude consists, but longitude itself, to an azimuth; he has prepared tables by which his calculations can be carried to any extent, and by which he can at any time, and under the most unfavorable circumstances, ascertain the longitude with the same facility and correctness as latitude is at present by the nautical instruments now in use. These latter are entirely superceded by the use of an instrument constructed by himself, of a simple description. He has every confidence in being able to explain and defend the principle and correctness of his discovery to any one, and is at this time endeavoring to bring it under the notice of Government.'

Artificial Mould for Casting.—Mr. Avery, the proprietor of an extensive iron foundry in Syracuse, N. Y., has made a very important discovery in relation to casting of iron. The Brattleboro' Inquirer states that on Mr. Avery's analyzing the earth used in his foundry, he found it to contain a certain proportion of blue clay; and that after repeated experiments, he discovered that if *common fine sand was mixed with common blue clay, in the proportion of one-tenth part of clay to nine-tenths of sand*, it would constitute the best possible composition for casting that he had ever used; even the most delicate castings came out perfectly free of sand, and required no sort of cleaning by vitriol.

Names of the Months.—These came to us from the Romans. January from Janus, an ancient king of Italy; February from the word februo, to purify, March from Mars, June from Juno; July and August were so named in honor of Julius and Augustus Cæsar. Before the time of Julius Cæsar, these months were called Quintilis and Sextilis, being the fifth and sixth months, reckoning as the Romans did, at that time, from March at the commencement of the year, and September, October, November and December, signifying the 7th, 8th, 9th and 10th months from March, when the year began.

Important Discovery.—The London correspondent of the Journal of Commerce mentions, on authority of a Salisbury (Eng.) paper, a most important discovery, which, if it realizes the anticipations of the inventor, must remove the only obstacle to the triumph of steam navigation. This is a new mode of producing heat, by which both wood and coal are to be superseded. The principal ingredient is water. The only material required besides, is something in a liquid form, which contains a large quantity of carbon; whale oil, tar, or almost anything of a similar kind, will answer the purpose. As these materials are put into the furnace simultaneously, and in combination with each other, the one yields its carbon, while the other gives out its hydrogen, and a small portion of atmospheric air is the only thing then required to keep them in a state of perfect combustion. The whiteness and intensity of the flame can hardly be imagined by any one who has not seen it, and yet it is so completely under management, that in one second it can be reduced or augmented as occasion may require. The account states that from the absence of all smoke, chimnies can be got rid of, and that a vessel may, without inconvenience, carry enough fuel to enable her to circumnavigate the globe. The editor of the English paper also states that at the Gas Works at Lymington it had been in successful operation three months.

New Machine.—Belfast, Maine, is getting famous for Yankee notions. The Journal says that Samuel Haynes, a shoemaker of that place, has made a machine for cutting shoe-leather. It is constructed of two cylinders, rolled together, on one of which are placed knives in such a manner as to cut a side of leather into vamps and quarters as the leather passes between the cylinders. It is said that one man, with this machine, can cut out more shoes in one hour than twelve men can cut by hand in a day, 'and do it better into the bargain.'

Extinguishing Fires by Steam.—An experiment, calculated to show the utility of steam in extinguishing fires, was exhibited at Mile End, Glasgow, on the premises of Mr. Clark. In a house fifteen feet square and ten high, combustible materials were put in the four corners and centre, and set on fire, and allowed to burn till the flames reached the height of about nine or ten feet; steam was then admitted into the house, which extinguished the flames in less than two minutes; and on opening the door in a few minutes after, the burning was found completely extinguished.

HENRY'S MAGNET.—An artificial magnet has been constructed by Professor Henry, of Princeton College, which far surpasses in power everything of the kind. A number of interesting experiments on the subject of electro-magnetism, were exhibited by means of this wonderful instrument, in the presence of the students, and a large number of gentlemen assembled to attend the late commencement.

Upon one trial of its strength, it was found to be capable of raising between three and four thousand pounds; and we learn with farther modification of the apparatus, the magnet will be able to sustain upwards of four thousand pounds.

Professor Henry has also made important improvements in the galvanic battery, when it is applied to the production of a magnetic power. The particulars of this improvement we are unable to explain, but for the sake of science, we hope that this gentleman will soon give to the public a full account of these improvements, and of their important results.

MARCH OF IMPROVEMENT.—The celebrated mathematician, Hoene Wrenski, is said to have discovered a new system of steam-engines, applicable to carriages on common roads, and all other locomotive instruments, such as ploughs and other implements of husbandry and of war. It is represented to be so vastly superior to anything of the kind that has preceded it, that the French Company has paid four millions of francs for the patent.

ADVANTAGE OF KNOWLEDGE.—A sewing needle, says the Mechanics' Magazine, or the blade of a penknife, being held in an upright posture, struck by a hammer, and afterwards floated by means of cork on water, or suspended by a thread, not drawn too tightly, would become a magnetic needle, and point north and south. The end of a poker, held vertically, and passed over its surface from one end to the other, would impart magnetism, which, if the needle be steel, would be of permanent character.

Many a vessel which has had its compass washed overboard in a storm, might have been saved from days and weeks of distress and peril, and perhaps even from destruction, by a little knowledge of magnetism.

EGYPTIAN ANTIQUITIES.—The cost of transporting the obelisk of Thebes to Paris will not be far from two millions of francs. An offer was made to convey Cleopatra's needle to England for nine thousand pounds.

MECHANICS IN THE CITY OF CANTON.—There are supposed to be in that city, 50,000 cloth manufacturers, 7,300 barbers, 4,200 shoemakers, beside a multitude of other mechanics, amounting, according to the most accurate calculations, to 246,000 in the whole. Two thousand persons are engaged in the practice of medicine. The entire population of the city cannot be far from 1,000,000.

TO CORRESPONDENTS.

W. W. C. is received and under consideration. We hope our correspondents will not forget us during the warm months.

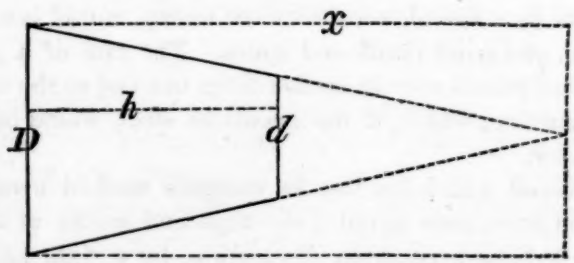
QUESTION.

Is there any rule in figures sufficiently correct, for ascertaining the twist, and *slaieing* of yarn; viz.—on the different numbers of cotton yarn, how many *twists* to the inch, how many threads should be *warped* to an inch, and what proportion of twists should *cops* or *filling* bear to *bobbins*, or *warp*?

PRELUDE.

ANSWERS.

MESSRS. EDITORS:—Having observed a question in the April number of the Mechanic respecting the frustrum of a cone, and not having a rule to solve it, I proceeded, by the help of the following diagram, to make a rule.



Those lines that have letters upon them are intended to be denoted by those letters.

Let it be taken for granted that we know a cone to be one third of a cylinder of equal basis and height; and that a square-based prism bears the same ratio to a cylinder whose diameter is equal to the side of the basis of the prism, that the side of a square does to the diameter of an inscribed circle.

By the proportion $D : x :: d : x - h$ we may find the length of $x = \frac{D\,h}{D - d}$. Then $\frac{D^3 h}{D - d}$ = the square based prism; $\frac{D^3 h}{3D - 3d}$ = the pyramid of equal basis and height: and $\frac{D d^2 h}{3D - 3d} - \frac{d^2 h}{3}$ = the pyramid whose diameter is d, and whose height is $x - h$, or more properly $\frac{Dh}{D - d} - h$. Then we have

$$\frac{D^3 h}{3D - 3d} - \frac{D d^2 h}{3D - 3d} + \frac{d^2 h}{3} = \left(\frac{D^3 - D d^2}{D - d} + d^2\right)\frac{h}{3} =$$

$(D^2 + Dd + d^2)\frac{h}{3}$. This, if multiplied by ·7854, denoting this decimal by a, the formula becomes $(D^2 + Dd + d^2)\frac{h}{3}\,a$ = frustrum of a cone. Now for the solution of the question.

Let $5x$ be the larger diameter and $3x$ the smaller; which will give them in the required proportion.

$$\begin{aligned} D^2 &= 25x^2 \\ d^2 &= 9x^2 \\ Dd &= 15x^2 \\ \hline & 49x^2 \end{aligned}$$

$49a\,\frac{h}{3}\,x^2 = F$. F, or the solid contents of the frustrum is $= 13 \times 231 = 3003$ solid inches.

$$x = \sqrt{\frac{F}{49a\frac{h}{3}}} = 4{\cdot}41167 \text{ inch.}$$

$3x = 13{\cdot}2501$ inches, = upper diameter;
$5x = 22.0835$ = lower diameter.

MESSRS. EDITORS:—In answer to the second question in the April number of the Mechanic, I would say that the diameter of the lower base, is 22·08 + inches, and the diameter of the upper base 13·25 inches.

The solution is as follows:—In the first place, it is to be noticed that the solidity or capacity of the vessel is 13×231, or 3003; and secondly, it is to be understood that it is a geometrical proposition, that if a pyramid is cut by a plane parallel to its base, the frustrum which remains after taking away the smaller pyramid is equal to 3 pyramids, which have for their common altitude the altitude of the frustrum; and whose bases are, the inferior base of the frustrum, its superior base, and a mean proportional between these bases; and the same for a *cone*.

We suppose now that the vessel is in the form of the frustrum of a square pyramid 12 inches high, and whose solidity or capacity is equal to that of the conical vessel: we now propose to find the side and area of the upper and lower bases of the vessel in the form of the frustrum of a pyramid.

Let $a = 3$
$b = 5$
$s = 3003$
$x =$ side of the lower base,
$\frac{ax}{b} =$ " " " upper "
$\sqrt{\frac{ax^2}{b}} =$ " " " mean "

It is now to be noticed that the solidity of a cone or pyramid, is equal to the square of the base multiplied by 1-3 of the altitude.

Hence by the foregoing propositions we have this equation:

$$4\left(x^2 + \frac{a^2x^2}{b^2} + \frac{ax^2}{b}\right) = s$$

This equation simplified, cleared of fractions, reduced, &c., gives

$$x^2 = \frac{b^2s}{4ab + 4a^2 + 4b^2} \text{ and } x = \sqrt{\frac{b^2s}{4ab + 4a^2 + 4b^2}}$$

By restoring the numbers, we have

19·57134 = side of the lower base of the pyramid,
11·74279 = " " " upper " " " "
15·16021 = " " " mean " " " "

It now remains to find what will be the diameter of the lower base of the frustrum of a cone, whose capacity is 3003, and whose area is = to $\overline{19\cdot57134}^2$. We say the ratio of the diameter of a circle is to the circumference as 1 : 3·141592, &c.

Let x = diameter of the circle
and $3\cdot141592x$ = circumference:

now the circumference multiplied by 1-4 the diameter is = the area.

Hence we have this equation $\frac{3\cdot141592x^2}{4} = \overline{19\cdot57134}^2$

By reducing this equation we have $x^2 = 487\cdot6981$ &c.
and $x = \sqrt{487\cdot6981 \text{ &c.}} = 22\cdot08$.

Hence we find that x, or the diameter of the lower base of the vessel is 22·08, and the diameter of the upper base 13·25 inches. E. G.

N. B. Calling these two numbers the diameters, proves the question within about 87-100 of an inch; probably, if in the above solution the decimals had been carried to double the number of places, it would have come out much nearer. Those who have the patience can try it, but we suppose that exactness in this question is not attainable.